

RECEIVED  
JUL 15 1996  
FCC  
AL ROCK

Q 8

Cylink is particularly concerned that without such rigorous engineering design and test, it cannot be determined *a priori*, as to whether any local geographic area encompassing short-or-medium range outdoor communications installations of proposed NII/SUPERNet products and Part 15 spread-spectrum users in the 5.8 GHz band will ever be able to avoid mutual interference because of "etiquette" and emission signature incompatibilities. Hence, there is the strong possibility that the band could be "poisoned" for both sets of users and unable to deliver a satisfactory level of telecommunications service to the very communities of interest that could most benefit. If solutions to spectrum sharing for quality telecommunications are found feasible between spread spectrum and non-spread spectrum technologies, and continuous circuit-switched and etiquette-based packet-switched operations, it opens up the likely attractive potential of a new Rulemaking for operating new spread spectrum devices in the 5.15 - 5.35 GHz band.

NTIA, in a November 2, 1995 Preliminary Technical Review accompanying a letter from Larry Irving to Chairman Reed Hundt concerning NII/SUPERNet deployment, comments that "NTIA does not object to careful study of the bands petitioners seek to use to determine whether sharing with current and future users is possible....." And, relative to use of the band for medium range point-to-point communications, "NTIA believes the Commission should explore whether there are other bands that are more appropriate for this kind of application." Cylink again agrees.

Cylink also suggests that the Commission already has before it, through existing Dockets addressing the same public users and uses of NII/SUPERNet type services, a number of alternatives to the 5.725 - 5.850 GHz band for both short-range wireless LAN or longer range outdoor communications. These can provide the services proposed in the *Notice* without compromising the status quo quality of communications for the public who currently benefit from Part 15 spread spectrum devices, nor jeopardizing the millions of dollars of investment that have led to American leadership in the global market for 5.8 GHz spread spectrum devices.

The economic and immediate availability of deployable devices to meet a variety of wideband communication needs extending from voice to video to computer data exchanges for electronic education, commerce and messaging applications requires a combination of wireless and wireline technologies. The applications cited in this *Notice* demand wireless products for flexible, economic and immediately available in-building and building to building use within campuses and commerce parks, and multiple alternative methods of access for connections of communities of interest to the National Information Infrastructure, represented by the Internet

and other service provider facilities. Cylink suggests that integrating the collective objectives and spectrum resources addressed within this *Notice*, and ET Docket 96-8 (*Amendment of the Commission's Rules Regarding Spread Spectrum Transmitters*) and ET Docket 94-124 (*Amendment of Parts 2 and 15 of the Commission's rules to Permit Use of Radio Frequencies Above 40 GHz for New Radio Applications*), in conjunction with the use of other existing spectrum allocations will provide spectrum-efficient answers to long term demands for the needs identified in this *Notice*.

Expanding the availability of spectrum for low power short-range wireless LAN environments will be served through the proposed availability of 350 megahertz of spectrum at 5.15 - 5.35 GHz and 5.725 - 5.875 GHz, subject to stringent technical specifications and standards necessary to prevent harmful interference to other services such as existing Part 15 spread spectrum devices already operating and successfully delivering telecommunications services in the 5.725 - 5.875 GHz band.

In addition, as an alternative or progressive complementary addition to the 5.8 GHz band for low power short-range communications, through ET Docket 94-124, a large contiguous block of contiguous bandwidth has been proposed for unlicensed high speed communications in the oxygen absorption band (59-64GHz). Millimeter wave bands can provide both the exclusivity and protection from interference that would normally be secured by licensing. The millimeter wave bands provide exactly the characteristics for wireless LAN short range educational and industrial campus area applications that require very high bandwidth or data transfer rates, such as the videoconferencing and very high rate local area applications identified for the NII/SUPERNet users, without any penalization of existing spread spectrum users. Thus, use of 200 MHz or 350 MHz of the 5 GHz band for low power short-range wireless LAN applications can satisfy existing demands and motivate the further economic development of virtually unlimited bandwidth millimeter-wave technologies for potential use throughout the world.

Similarly, in lieu of introducing potentially interfering non-spread spectrum technologies in the 5.8 GHz band for longer range outdoor community networking communications for NII/SUPERNet applications, for example, from campuses and industrial parks to NII or network service provider points of presence, or between more distant campuses sharing communities of interest, ET Docket No. 96-8 can provide for the routine unlicensed authorization of outdoor point-to-point links in the 2.4 GHz and the 5.8 GHz bands. Spread spectrum devices in these bands are already sharing and efficiently reusing spectrum with present

capacity to serve thousands of additional NII/SUPERNet users with data rates of 19.2 Kbps up to 2.048 Mbps, sufficient for a link to handle several simultaneous channels of videoconferencing.

Other alternatives for outdoor communications have been identified in the proceeding for ET Docket 94-124, wherein many commentors (e.g., Hughes Aircraft Company GHZ Equipment Co., Inc ) proposed solutions to use millimeter wave technology, in the near term, as higher power medium-range or "last-mile" components of any "information superhighway" or community network for sophisticated services to handle data and voice as well as video in an interactive mode. These applications were particularly cited as of value in educational institutions, with one commentor, "Educational Parties," proposing 1 GHZ allocation set-aside for educational and public service uses.

And finally, the alternate availability of other highly competitive telecommunications facilities for NII access, such as new licensed wide bandwidth spectrum for local distribution and wideband cable TV community networking deployments, encouraged by the landmark Telecommunications Act of 1996, can serve to complement NII/SUPERNet connectivity needs for the more permanent connections to provider "point-of-presence" locations. Hence, Cylink agrees with the Commissions suggestions to seek comments on the applicability of other bands to better accommodate higher power community network operations because of the potential infeasibility of sharing with lower power devices.

In summary, the Commission now has the opportunity to provide the United States with an integrated spectrum architecture to provide enhanced unlicensed digital telecommunications services, some to still be invented, to the public over the next decade. This coordinated action can encourage new investments in technological leadership for the design, manufacture and export of equipment for a global economy and repeat the unprecedented success of the Commission through its forward-looking incubation of the Part 15 industry. By reviewing the similar needs across the range of spectrum rulemakings currently in process, conservation of a precious resource can be emphasized without compromising quality of service, innovation of development, or current investments and facilities in Part 15 spread spectrum devices in the 5.8 GHz band.

Foreseeing potential problems of sharing spectrum among different modulation and switching technologies can also avoid the lengthy proceedings and chilling effects that have plagued other potential offerings. For these reasons, Cylink supports the Commission's intent in creating a regulatory environment hospitable to

NII/SUPERNet services and proposes evaluating and integrating the comments from the other related Dockets as additional vehicles to provide such services while protecting the integrity of the 5.8 GHz devices.

## **1. DISCUSSION**

Cylink Corporation ("Cylink") respectfully submits its comments in the above-referenced proceeding. Cylink, based in Sunnyvale, California, is a pioneer in the commercial application of spread spectrum technologies. In 1986, Cylink started a research and development effort to develop commercial spread spectrum radio products conforming to the FCC Part 15 rules. This effort resulted in a family of commercial digital modem products operating in all three ISM bands (i.e., 902-928 MHz, 2.400-2.4835 GHz and 5.725-5.850 GHz). Many thousands of Cylink spread spectrum digital modems offer voice or data or videoconferencing communications at data rates up to 2.048 Mbps and installed operating ranges in excess of 30 miles. This equipment is currently manufactured in Sunnyvale and used in the United States and approximately 30 countries worldwide. Cylink AirLink radios have been authorized to operate under Section 15.247 of the Rules and serve a variety of point-to-point communications needs.

Cylink outdoor systems support and enable many activities that advance the public interest. These include videoconferencing, high speed Internet connectivity for schools, the linking of government offices and public safety facilities, energy utility applications, telemedicine circuits, intelligent transportation system links for traffic monitoring and signal light control, connection of cellular and PCS sites, and thin route T-1 common carrier voice and data links.

Indeed, the point-to-point links made possible by Cylink equipment provide key infrastructure support for important policy objectives set forth in the Telecommunications Act of 1996. These include efforts to extend universal service, make advanced services available to rural areas, tie remote clinics to more advanced health care facilities and link schools and libraries to the NII. Professional caliber equipment from Cylink operating in the 5.8 GHz band stands out as a very cost effective means for quickly initiating multi-line circuits to serve new clusters of residences, schools, construction sites and commercial and industrial facilities.

With the FCC's leadership in the initial 1985 establishment of unlicensed services by low-power devices in the ISM bands, Cylink has been active internationally demonstrating the success of such services. Appearing in front of appropriate regulatory bodies in countries in Eastern Europe, Latin America, and in the Far East

and other developing areas, Cylink has successfully assisted in the allocation of similar bands for deployment of equipment developed and made in the United States. This has led to substantial export business opportunity for Cylink and other Part 15 manufacturers who lead the world in the development and application of this technology.

The creation of the Part 15 spread spectrum industry, through the actions of the Commission, has a parallel in the creation of the PC industry. In neither case could the realization of the enormous success been forecast at the time of the original decision. The possibility of low-cost, easily deployable public access to services for communications and monitoring unleashed American ingenuity at its best. Companies invested in developing interference-resistant spread-spectrum technologies for application to low power devices, and users were able to identify needs and applications which could not be solved by other products. As in the case of the PC providing easily accessible computing power, by lowering the threshold of economic, administrative and physical access to communications, new applications have been developed by third parties which have resulted in millions of installed spread spectrum devices.

## **2. PRESERVATION OF HIGH QUALITY PART 15 SPREAD SPECTRUM COMMUNICATIONS IN THE 5.8 GHZ BAND IS IN THE PUBLIC INTEREST**

Today, the critical importance of unlicensed Part 15 wireless spread spectrum systems to the future development of the National Information Infrastructure is well recognized and supported. The Commission has continually reaffirmed its support for the use of the ISM bands by Part 15 spread spectrum technologies and has continued to encourage manufacturers to invest in the development of such technologies.

A demonstrated public need has been met with devices proven to: provide very low-cost broadband access to Internet services and other information networks for schools, libraries, telecommuters and offices in homes, provide mobility of telephonic and computer communications within offices and homes without extensive reconstruction and wiring, enable immediately installable videoconferencing among and between buildings for educational instruction, health care monitoring and judicial procedures without construction of special studio facilities, facilitate the safe transport of chemicals and petroleum products through low-cost and easily deployable pipeline monitoring services, and enable control for potentially tens of thousands of traffic lights, at less than one-third the cost of wireline solutions, to ease road congestion, and significantly reduce pollution and new street construction. The third party industry of Part 15 resellers, system integrators,

maintenance personnel and application service developers is in a rapid growth phase to satisfy the previously described market needs and to invent new ones for public and corporate users.

Cylink believes that any potentially conflicting operational problems of NII/SUPERNet spectrum usage within the 5.8 GHz band faced by the Commission cannot be resolved unless it is determined, prior to production manufacturing and deployment, that NII/SUPERNet devices will not cause objectionable interference into spread spectrum devices operating in accordance with Section 15.247 of the Commission's Rules with a waiver of the 6 dBw effective isotropic radiated power ("EIRP") requirements. Inclusion of non-spread spectrum communications equipment within the 5.8 GHz ISM band, where specific spread-spectrum equipment has been developed based on the technical regulations which are only available in the ISM bands, must first be proven to demonstrate that it will not cause performance disabling interference to such spread spectrum equipment devices nor require any new restrictions or limitations on such spread spectrum devices.

Through potential compromise of the projected interference environment through the introduction of different technology emitters at new power levels in the 5.8 GHz band, manufacturers may see considerable risks in undertaking major research and development investments. Products yet-to-be-developed may be indefinitely lost. Public users for each of the technology products serving current NII or SUPERNet type applications may see similar risks in capital budgeting for purchase and installation of devices and communications services that may be rendered unreliable by potential unpredictable interference environments that have not been projected in the design of equipment.

### **3. THERE ARE TECHNICAL UNCERTAINTIES OF SPECTRUM SHARING THAT FIRST MUST BE RESOLVED PRIOR TO DEPLOYMENT OF NON-SPREAD SPECTRUM PRODUCTS IN THE 5.8 GHZ BAND**

The Commission has proposed (at paragraph #2 of the *Notice*, that NII/SUPERNet "...devices be subject to the minimum technical standards necessary to prevent interference to other services and to ensure that the spectrum is used efficiently." Additionally, WINForum states that existing Part 15 bands cannot be used for SUPERNet services because conventional Part 15 devices would not comply with a necessary spectrum etiquette and therefore would be incompatible with SUPERNet devices. AT&T opposed the original Apple NII proposal to allocate the 5.725 - 5.875 GHz band on the basis that the Part 15 spread spectrum devices

could not easily share this band. The Fixed Point-to-Point Communications Section, Network Equipment Division of the Telecommunications Industry Association ("TIA") states that many issues, like spectrum sharing, need to be addressed before spectrum is allocated for such (NII/SUPERNet) a service.

There is a general consensus and serious agreement that the issues of spectrum sharing must first be resolved in order to allocate the spectrum and assure the public that high quality services can be provided with the NII/SUPERNet bands. This will require open review, analyses, testing and agreement among the industry community of interest in order to develop specifications that benefit the public with certainty and allow a competitive manufacturing framework of providers.

The primary technical issues deal with emission power and signatures and spectrum etiquette. NII/SUPERNet devices will be permitted to generate a spectral mask that will exhibit concentrations of power at discrete frequencies, and in fact, the spectral mask could be time-variant, that is, it could change over time depending on the underlying structures of the data. Part 15 ISM band spread spectrum signals are required to provide a certain degree of randomness in the signal structure, which is achieved partially by the fact that Pseudo-Noise (PN) codes are imposed on the underlying traffic, and by the fact that the transmitted power is spread into a bandwidth at least 10 times that which would be required if spread spectrum modulation were not used. This results in a smoother spectral mask with very few, if any, small discrete spectral components. This characteristic of spread spectrum signals is one of the main reasons why multiple signals can co-exist and efficiently share the same band and is, of course, a primary reason for using Part 15 spread spectrum in the ISM bands.

The fact that NII/SUPERNet emitters can have a spectral signature that exhibits strong spectral components that can vary over time suggests that the potential for harmful interference to existing 5.8 GHz band spread spectrum systems could be greater when compared to another Part 15 spread spectrum transmitter, depending upon the precise signal structure of the system. Power spectral density specifications and requirements and measurement techniques must be established and tested to confidently evaluate the ability of the differing technologies to share the 5.8 GHz band, and achieve their target performance objectives and coexistence among low power short range communications and longer range spread spectrum links, without imposing any new restrictions or constraints on the spread spectrum devices.

Commentors have also identified the issues of the necessity of agreeing upon spectrum sharing protocols or



rules as a potential obstacle to mitigating mutual interference and high frequency reuse among NII/SUPERNet devices. Specifically, within the 5.8 GHz band, there are no requirements for such rules because there is no limitation on the use of spread spectrum devices only to packetized data traffic. Whereby the bursty nature of packet traffic may permit collision avoidance or collision detection techniques, the market forces driving the use of Part 15 spread spectrum devices in the 5.8 GHz band are not so constrained.

Hence, Cylink and other vendor equipment provides voice trunking solutions for thin route, emergency service, videoconferencing and other applications involving continuous operations over circuit-switched network topologies. In fact, the markets often require this level of dependability for the availability of the telecommunications link. Product development and manufacturing investments have been made on the basis of providing the public benefits of immediately deployable unlicensed capacities of continuous full duplex and half-duplex transmission which could conflict or interfere with the ability of an NII/SUPERNet protocol to seize channel capacity. Therefore, further detailed analyses is required to determine the possibility for coexistence with the spread spectrum devices in the 5.8 GHz band, because of the radical differences of the technologies employed to transport packet or cell-based data which is the basis for NII/SUPERNet services.

**4. AUTHORIZATION OF AUCTIONS OR LICENSED SERVICES IN THE 5.725 - 5.850 GHz BAND OFFERS NO BENEFIT TO THE PUBLIC AND DESTROYS THE UTILITY OF EXISTING PART 15 SPREAD SPECTRUM SERVICES.**

The unlicensed Part 15 bands are truly "entrepreneurs' bands." As NTIA has made clear, the availability of these unlicensed bands provides "significant opportunities for innovators and small companies to make contributions to the overall mix of products and services available through the NII." Outside of these bands, there is precious little spectrum available for the development of entrepreneurial businesses, which cannot afford the high cost of acquiring a license.

Cylink opposes any suggestion that the band should be auctioned for licensed or unlicensed use. The auction authority conferred by Congress was not intended to substitute for the Commission's responsibility to allocate spectrum in the common interest. Levels of service can not be guaranteed within an ISM band because of unpredictable levels of interference. Also, given the uncertainties associated with availability of bandwidth within a given geographic area because of the inherent spectrum-sharing required, the driving force for the use of this band is the public willingness to, at their option, trade convenience and flexibility of

service and device transportability for the costs of fixed guaranteed service. Cylink suggests that the fabric and policies behind the developing need for NII/SUPERNet services have been based on the lowest possible barriers to gain access to wide bandwidth telecommunications services. Auctions and licensing would destroy the incentives to the construction of community-of-interest networks for all.

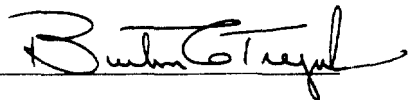
## **5. CONCLUSION**

Cylink applauds the Commission's changes in this *Notice* to provide a new category of unlicensed equipment for short range wideband local area networks and to facilitate access to the NII with operations in the 5.15 - 5.35 GHz band and agrees with the decision to not accommodate higher power longer range communications. Cylink further recommends the development and testing of technical specifications, prior to deployment, to determine the potential for sharing the 5.725 - 5.850 band among low power short range NII/SUPERNet devices and spread spectrum equipment to ensure that NII/SUPERNet systems are not operated in such a manner as to degrade, obstruct or interrupt Part 15 spread spectrum devices to such an extent that spread spectrum operations will be negatively affected.

Cylink also proposes that other related Dockets, specifically ET Docket 96-8 and ET Docket 94-124, which pertain to providing additional spectrum and facilities to satisfy growing needs for NII/SUPERNet applications, also be evaluated to provide an integrated spectrum architecture to serve the public's needs during this next decade and provide a base for continuing United States leadership in the development and global deployment of new unlicensed communications products

Respectfully submitted,

**CYLINK CORPORATION**

By: 

Burton G. Tregub

Vice President, Strategic Programs

Cylink Corporation

910 Hermosa Court

Sunnyvale, CA 94086

(408) 735-6667